NASA Strategic Human Capital Plan

Administrator's Message

Our mandate is to push the envelope in aeronautics and space exploration … to do what has never been done before … and cannot be done by anyone but us. NASA scientists, engineers, researchers, and technicians have made remarkable discoveries and advancements that have inspired and touched the lives of all Americans. We are an agency committed to "pioneering the future."

Over the past few months, the Agency has been engaged in charting a clear vision and mission to support that pioneering spirit. There is a renewed focus on executing NASA's mission: To understand and protect our home planet; to explore the Universe and search for life; to inspire the next generation of explorers ... ***as only NASA can***.

NASA's most critical asset in accomplishing that mission safely is the excellence of its workforce. Since becoming Administrator, it has been my good fortune to meet some of the most innovative and imaginative people our Nation has ever produced. The men and women of NASA do remarkable things every day with a dedication that is amazing.

We must ensure the Agency continues to have the scientific and technical expertise necessary to preserve the nation's role as a leader in aeronautics, earth and space science, and technology, as well as a cadre of professionals to address NASA's financial, acquisition, and business challenges. Today, however, NASA's ability to maintain a workforce with the talent it needs to perform cutting-edge work is threatened by several converging trends.

As with other agencies, NASA faces an aging workforce and projected retirements. Additional cause for concern, particularly for an R&D agency like NASA, is the decreasing number of young people pursuing studies in math, science, and engineering while the demand for such talent is rising both in Government and private sectors. We face skills imbalances, lack of depth in some critical competencies, and a lack of diversity in the workforce.

The current environment makes it imperative that NASA develop – and execute – an *integrated*, *systematic*, *Agencywide approach* to human capital management that will enable various parts of the Agency to work together as "One NASA" to perform the work we are charged to do safely and effectively, ensuring that the resources entrusted to us are well managed and wisely used.

Continuing to attract and sustain a high performing workforce – and recognizing and rewarding the talents of <u>all</u> our people – is crucial to our success.

Sean O'Keefe
Administrator

NASA Vision ►

To improve life here,
To extend life to there,
To find life beyond.

NASA Mission ►

To understand and protect our home planet
To explore the Universe and search for life
To inspire the next generation of explorers
… as only NASA can.

NASA Values ►

- **Safety**

NASA's mission success starts with safety. A commitment to safety permeates everything we do. We are committed to protecting the safety and health of the general public, the NASA workforce, and our high-value assets, on and off the ground.

- **People**

Our greatest strength is our workforce, a team of highly qualified individuals that is representative, at all levels, of America's diversity. We foster a culture of trust, respect, teamwork, communication, creativity, equal opportunity, and empowerment.

- **Excellence**

We are committed to excellence. We continuously improve our processes, products, and services to better serve our customers.

- **Integrity**

We are honest and ethical in all that we do. We deliver on our commitments, and we are accountable for our performance.

Introduction

The NASA workforce has experienced major changes over the past decade. From FY 1993 to FY 2000, NASA achieved a 26 percent reduction in its civil service complement, including a 50 percent reduction at Headquarters. Organizational restructuring and reductions in SES and other supervisory positions resulted in a 52 percent reduction in supervisory positions, a 15 percent reduction in SES, and a resulting increase, on an Agencywide basis, of the supervisory ratio from 1:6 to 1:10. NASA currently has approximately 19,000 civil servants (full-time permanent and other than full-time permanent).

Implementation of Agency downsizing was measured and gradual based on an Agency commitment that no NASA employee would lose his or her job through a reduction in force. Voluntary separation through buyouts and attrition were the primary tools used to reduce the workforce and thus many reductions took place in the cadre consisting of the senior technical workforce. Some retraining of Center personnel and realignment between Centers helped alleviate the problem; however, shortages in critical skills areas and core competencies, as well as erosion of experience and corporate knowledge, have resulted in some areas.

A number of broad, comprehensive reviews have taken place over the past several years within the Agency. The Strategic Resources Review (SRR), the NASA Integrated Action Team (NIAT) review, annual Aerospace Safety Advisory Panel (ASAP) reviews, the joint OMB/NASA personnel review, and several external reviews and audits point to, among many other findings, the ultimate requirement for attracting, hiring, retaining, and continually developing a world-class workforce to ensure NASA mission success.

Since its inception, NASA has been closely linked with the private and academic sectors. Less than 13 percent of the Agency's authorized funding is expended on civil service salaries and benefits. Historically, the Agency has acquired a variety of scientific, technical, and support services for the civil aeronautics and space programs through reliance on the private sector. NASA continues to strive for an effective mix of permanent civil servants, time-limited civil service appointees, contractor personnel, and individuals from the academic world who contribute through post-doctoral fellowships, grants programs, Intergovernmental Personnel Assignments (IPA's), and other partnerships. Under the Agency's competitive sourcing activities, NASA will continue to explore methods and opportunities to achieve greater efficiency and effectiveness, leveraging the government/contractor structure and ensuring safety and continuity.

NASA is guided by the principle that, as a premier research and development agency, we should do only those things that would not be done if we did not undertake them. In addition, work that can be done more efficiently and effectively in the private sector or academia will be performed there. Currently, approximately 68 percent of the NASA workforce is comprised of support contractors, excluding off-site prime and

subcontractors executing programs. Total direct private sector employment that results from NASA expenditures exceeds 100,000 work years of effort annually.

Drivers

In addition to internal and external reviews touching on the Agency's human capital issues, the Administration's emphasis on, and Congressional interest in, human capital challenges have influenced NASA's Strategic Human Capital Plan (SHCP). Furthermore, current nationwide and internal trends threaten NASA's ability to maintain a highly skilled workforce, heightening the imperative to develop a comprehensive, integrated approach to human capital management.

The President's Management Agenda. The President's Management Agenda (PMA) reflects a strategy for improving the management and performance of the Federal Government, making it more citizen-centered and results-oriented, and making good on its promises to the American people. Accordingly, it is a catalyst for significant change in the Agency. In a comprehensive effort to focus on Government improvement and results, the PMA presents five Governmentwide initiatives. They are: Strategic Management of Human Capital, Competitive Sourcing, Improved Financial Performance, Expanded Electronic Government, and Budget and Performance Integration. The Governmentwide initiatives outlined in the PMA, as well as certain NASA-specific goals, have potential civil service workforce implications – some to a greater degree than others – with potentially far-reaching impact on the way we work. NASA must assure that these initiatives are implemented within the Agency in a well-planned, consistent, and coordinated manner.

Congressional Interest. Oversight committees and individual members of Congress have taken an active interest in the viability of the Federal workforce to perform efficiently and serve the needs of Americans in an effective way. The December 2000 "Report to the President: The Crisis in Human Capital," for example, highlights concern and support for efforts to strengthen the workforce and the General Accounting Office has named human capital a management challenge for NASA and across the Federal Government.

Human Capital-Related Standards and Tools. A number of diagnostic tools and standards for success have been developed to assist agencies to better manage their human capital assets. NASA has taken many of these into consideration in developing this Plan.

Office of Management and Budget (OMB) Standards for Success. OMB devised an initial "scorecard" and standards for success by which agencies will be assessed on progress in implementing the PMA initiatives. The scorecard for human capital management incorporates a wide range of factors, including the degree to which an agency has a citizen-centered organizational structure that is delayered and oriented toward performing the mission assigned to it, the size of skill gaps, performance

management, and increased emphasis on workforce change associated with acquiring, retaining, developing and rewarding the right people for the right work at the right time.

Office of Personnel Management Human Capital Scorecard. OPM also developed an initial human capital scorecard and a set of associated measures to support the OMB scorecard. OPM devised dimensions and measures to help agencies improve the deployment and management of human resources. OPM's scorecard was developed utilizing the best practices of the private sector and focused on key themes or dimensions: Strategic Alignment, Strategic Competencies, Leadership, Performance Culture, Learning, and Accountability.

General Accounting Office Tools. In addition to the work done by OMB and OPM, the GAO developed a Human Capital Self-Assessment Checklist for Agency Leaders and a Model of Strategic Human Capital Management. These GAO products are intended to be "diagnostic tools" to assist agencies in managing human capital more strategically. These have also had an influence on the Agency's strategic human capital management efforts.[1]

NASA's Human Capital Challenge. A world-class science and engineering agency requires a world-class workforce. NASA seeks the "best and brightest" scientists and engineers (S&E's) to accomplish its core work. It also requires a highly competent, skilled staff to support NASA's technical programs and address the Agency's financial, acquisition, and business management challenges.

NASA's ability to attract and retain a world-class, diverse S&E workforce is threatened[2] by several ***nationwide trends***

- A shrinking S&E pipeline
- Increased competition for technical skills
- Lack of diversity in the applicant pool

Contributing to this challenge are demographics and ***trends within NASA***

- Skills imbalances and lack of depth in critical competencies
- Significant loss of knowledge due to projected retirements
- Increased recruitment and retention problems

While individuals still find NASA's mission exciting and want the hands-on experience, the market is extremely competitive for individuals with the technical skills critical to

[1] Revised Human Capital Standards for Success were released subsequent to development, but prior to issuance, of the NASA Strategic Human Capital Plan and accompanying Strategic Human Capital Implementation Plan. The revised standards integrated the elements of OMB's, OPM's, and GAO's guidance and centered on human capital dimensions of Strategic Alignment, Workforce Planning and Deployment, Leadership and Knowledge Management, Performance Culture, Talent, and Accountability. NASA's Strategic Human Capital Plan and Implementation Plan are consistent with the revised standards.
[2] Additional detail concerning these nationwide and internal trends is contained in Appendix B.

NASA and, while economic growth slowed over the last year, economic recovery will exacerbate the demand for critical skills NASA seeks.

As the Agency moves out of operations and more into research and development, we must address our ability to continue to acquire those individuals who will be essential for our core science and engineering work and contractor oversight roles, and maintain the experience, knowledge, management skill, and leadership needed to pursue NASA's vision and safely achieve its mission. Traditional recruitment efforts are not enough. New and better tools are required to attract the diverse, skilled workforce NASA needs to maintain the Nation's leadership and preeminence in aeronautics and space.

A summary analysis of workforce challenges, with emphasis on the scientist and engineer workforce, is included as an appendix to this document. NASA has identified in a companion Strategic Human Capital Implementation Plan (SHC***I***P) a menu of possible tools and legislative reforms to enhance management flexibility, to correct skills imbalances, and to enhance recruitment and retention in needed areas.

Ultimately, strategic management of human capital is the right thing to do because the realization of NASA's vision and mission depends on its people. This Plan is intended to be useful and responsive to long-term, as well as short-term, changes within the Agency – to be agile, flexible and resilient – to accommodate circumstances not only as they are today but as they will unfold in the future. It is a roadmap that, when followed, will enable the Agency's human resources to accomplish the Agency's bold mission.

NASA Strategic Human Capital Architecture and Improvement Initiatives

As the basis for its Strategic Human Capital Plan, NASA embraced the OMB standards for success and OPM's dimensions and recast them in terms of an overarching architecture. This architecture is structured around five "Pillars" – Strategic Alignment, Strategic Competencies, Learning, Performance Culture, and Leadership, the last of which provides the foundation for all the others – with each pillar further defined in terms of high-level goals and strategies. Section 2, Table 1, of the SHCIP, lays out each pillar and its associated goals and strategies. Once the architecture was in place, a team of senior NASA managers did an assessment – or "gap analysis" – of the Agency's current strengths and weaknesses in human capital management.

NASA already has in place a wide variety of programs, initiatives, activities and tools to address issues relating to the recruitment, retention, training and development of the workforce. NASA will continue this work and will realign activities, where necessary, consistent with the goals and objectives of this SHCP. Furthermore, NASA's Freedom to Manage activities to date have included reviews of existing internal and external barriers and impediments to human capital management (in addition to other areas) and have resulted in the development of legislative proposals and internal actions designed to enhance flexibility and place accountability where it should be. NASA has delegated numerous authorities to the Centers (e.g., IPA's, SES cash awards); reduced levels of

review on organizational changes; streamlined processes (e.g., SES staffing); and provided automated tools to improve operations.

NASA's internal assessment of the Agency's current state of human capital management, however, did highlight nine major focus areas – or key "improvement initiatives" – that merit special emphasis and where expenditure of resources can be expected to yield the greatest benefit. These are organized under the five pillars. Together, their implementation will greatly enhance the Agency's ability to effectively manage its human capital and maintain its preeminence as a world-class organization with a highly motivated, skilled, productive and innovative workforce – and enhance realization of a "One NASA."

What does "One NASA" mean? It means:

- Centers working together effectively and efficiently to achieve a common set of goals and priorities
- Programs/projects supporting and collaborating with each other
- Alignment and integration of leaders, resources, systems, processes, and people
- Developing Agency, rather than Center, skills and sharing knowledge, experience, and lessons learned to enhance performance across the Agency (technical and business)
- Enhanced understanding and appreciation for each Center's contribution to the Agency mission, with each individual taking pride in all NASA's achievements
- Improved sharing of NASA's products and services with the public

Improvement Initiatives. The key improvement initiatives initially identified have been accepted and endorsed by Agency management. A brief discussion follows of the gap analysis conducted and the related improvement initiatives.

PILLAR 1 – STRATEGIC ALIGNMENT. NASA currently has a standard Agencywide personnel system that performs personnel administration, payroll processing and reporting on civil service employees. It has limited functionality, however, and does not contain the data required for strategic workforce management. Much of the current workforce planning and analysis is accomplished at the Center level, which permits ambiguities in roles and responsibilities to persist, contributes to a stovepipe view of the workforce, and inhibits the ability to track and forecast human capital across programs. Therefore, an Agencywide system that would promote better analysis, planning, management, and alignment of human resources to best achieve Agency strategic goals and objectives is needed. With this capability, NASA can focus use of human resources flexibilities to address areas of concern to achieve optimum alignment between the workforce and the mission.

Improvement Initiatives

- ***Develop and implement an Agencywide integrated workforce planning and analysis capability.***

- ***Increase the utilization of flexibilities and tools to ensure a highly skilled, diverse and productive workforce.***

The result of implementing these improvement initiatives will be an integrated approach to determining capabilities needed to support the NASA mission, more effective deployment of the workforce across programs and projects resulting in enhanced mission performance, and an increased ability to attract and keep a highly skilled diverse workforce through focused use of HR flexibilities where they are most needed.

PILLAR 2 – STRATEGIC COMPETENCIES. An integral element of effective workforce planning – necessary to achieving strategic alignment of the workforce to the mission – is the ability to identify existing competencies, those needed, and resulting excesses or gaps. Centers currently do this on a Center-by-Center and/or organization-by-organization basis, each using its own descriptive lexicon. What is needed, however, is an Agencywide competency management system, with common definitions, that would allow senior managers to get a more accurate picture of the Agency's competency strengths and weaknesses. This, in turn, would increase management's flexibility in developing options to resolve imbalances (e.g., focusing recruitment, retention, training, and other HR tools and flexibilities where they are most needed). Related to this is the need to maintain a pipeline of new talent from which the Agency and its partners can draw to satisfy future competency needs. The Agency already has a number of programs, K-12 through post-graduate, to encourage students to pursue science, math, engineering, and technology studies. NASA has made education a core mission and is pursuing a more coordinated management approach that will further enhance our reach and improve our performance in the education arena. In addition to those efforts, however, the Agency also needs an improved link between these "feeder" programs and projected workforce requirements.

Improvement Initiatives

- ***Develop an Agency competency management system that defines competencies the Agency must retain and those for which it will rely on industry, academia, and others.***

- ***Ensure that NASA education programs match a diverse population of students with projected NASA workforce needs.***

Implementing these initiatives will contribute to NASA's ability to acquire the competencies it needs now and those it will need in the future due to changing priorities/programs and workforce attrition.

PILLAR 3 – LEARNING. NASA has always recognized the importance of training and development and has developed and funded an extensive catalog of courses and programs designed to enhance employees' technical proficiency and career development. Considerable attention has been paid, particularly in recent years, to increasing the scope and availability of these offerings, including the use of e-learning

methods. Given that resources (both dollars and time) that can be dedicated to training and development are constrained, however, optimizing NASA's investment consistent with its mission and priorities – as well as maximizing the benefits to the employees – is critical. In addition, given current workforce demographics, particular attention must be focused on assuring the Agency captures and makes available the wealth of expertise and experience the current workforce possesses – as well as that which resides outside the Agency in similar organizations – to aid in developing the next generation of project/business managers and leaders.

Improvement Initiatives

- ***Ensure training and development programs build needed competencies, including more effective incorporation of knowledge sharing and mentoring in the development of employees.***

- ***Capture knowledge and lessons learned (from failures and successes) in a more effective, systematic way.***

Implementing these initiatives will help ensure a more knowledgeable, highly skilled workforce and will contribute to better performance and improved mission success.

PILLAR 4 – PERFORMANCE CULTURE. The fundamental purpose of the NASA Employee Performance and Communication System is to improve individual and organizational performance by enhancing two-way communication between supervisors and employees. Sometimes, however, the process of communicating expectations, assigning accountability for results, assessing performance, and identifying ways to assure future performance breaks down. The result can be that marginal performance is allowed to continue without intervention. This can, in turn, lead to morale problems, degraded program/project performance, failure to achieve Agency goals and objectives and/or failure to fully realize Agency values. Similarly, NASA awards and recognition programs are designed to incentivize performance. The Agency has embarked on a study of how well current Agency recognition programs foster those behaviors that lead to mission success.

Improvement Initiatives

- ***Assure the Agencywide performance management system focuses on accountability for results.***

- ***Assure that employee rewards and recognition programs are adequately linked to performance that contributes to achievement of Agency goals.***

Implementing these initiatives will contribute to improving personal and organizational performance and enhanced mission success through more effective use of the diverse talents and abilities of the NASA workforce.

PILLAR 5 – LEADERSHIP. NASA's existing leadership training and development programs are comprehensive. Beginning with the development and implementation of the NASA Leadership Model, the Agency has placed emphasis on leadership evaluation and development through evaluation instruments, local and distributed learning opportunities, workshops, seminars, conferences, and resident classes. Further, NASA's Senior Executive Service Candidate Development Program is praised across the Federal government for its thoroughness, breadth, and effectiveness in developing NASA's future senior executives. More, however, can be done. Carefully crafted initiatives, well designed systems, and eloquent value statements are less than compelling without high caliber leaders who provide support and who demonstrate commitment, responsibility, and accountability. Participants in leadership programs should be selected through the thoughtful consideration of leadership potential and future needs across the Agency. In addition, employees currently in leadership positions should not only continue to strive for their professional growth but should also share their practical experience with those who will follow in their footsteps. Ultimately, NASA must value, reward, and retain a world-class leadership cadre that is diverse, inclusive and effective.

Improvement Initiative

- ***Ensure that an integrated, strategic training and development program builds needed Agency leadership competencies.***

Implementing this initiative will help to ensure the Agency has the right type and number of diverse leaders to achieve mission success now and in the future.

A short summation of the five pillars of NASA's strategic human capital architecture, as well as the results of the gap analysis conducted, is reflected in the following charts.

NASA's Strategic Human Capital Plan architecture is built on 5 Pillars, which are derived from 6 themes or dimensions used by OPM and consistent with OMB criteria for successful human capital management. Each Pillar has associated goals and strategies relevant to NASA.

An assessment of NASA's current state in each Pillar area has been made. Where problems have been identified or enhanced performance is desired, NASA has identified improvement initiatives designed to achieve the desired state. Assessment results are synopsized on the following page, including summary goal statements, problems, improvement initiatives, and intended outcomes.

Pillar	Definition
Strategic Alignment	NASA aligns human capital to support the vision and accomplish the Agency's mission and goals.
Strategic Competencies	NASA recruits, acquires, and retains a diverse workforce with world-class capabilities in strategic competencies needed for all components of its mission.
Learning	NASA promotes a knowledge-sharing culture and a climate of openness, continuous learning and improvement.
Performance Culture	NASA creates a culture that focuses on results, motivates employees to perform, and ensures fairness in the workplace.
Leadership	NASA ensures it has leaders who are adaptable; who inspire, motivate, and guide others towards goals; who mentor and challenge the workforce; and who demonstrate high standards of honesty, integrity, trust, openness, and respect.

PILLAR	GOAL SUMMARY	PROBLEM	IMPROVEMENT INITIATIVE	OUTCOMES/RESULTS
STRATEGIC ALIGNMENT	The Agency is organized to support its mission in a safe, effective and efficient way. Each organization understands its contribution to the Agency mission and each employee understands his or her personal contribution.	• Fail to achieve "One NASA" due to ambiguity in roles and responsibilities or stovepipe behaviors • Smaller workforce – not deployed most effectively • Inadequate ability to track/forecast human capital across programs	***Develop and implement an Agencywide integrated workforce planning and analysis capability.*** ***Increase the utilization of flexibilities and tools to ensure a highly skilled, diverse and productive workforce.***	• "One NASA" with integrated capabilities to support NASA missions • Better deployed workforce and enhanced mission performance • Increased ability to attract and keep highly skilled diverse workforce
STRATEGIC COMPETENCIES	NASA understands the competencies required for safe and successful missions and recruits, acquires and retains a world-class workforce representative of the Nation's diversity and consistent with competency needs.	• Inadequate ability to identify imbalances in current and projected workforce arising from changing priorities and turnover • A shrinking national pipeline of talent needed for the future	***Develop an Agency competency management system that defines competencies the Agency must retain and those for which it will rely on industry, academia and others.*** ***Ensure that NASA education programs match a diverse population of students with projected NASA workforce needs.***	• Agency has skills it needs • Contribute to ensuring a source of competencies needed to assure future mission success
LEARNING	NASA assures mission success by using existing knowledge effectively and acquiring new knowledge through learning.	• Fail to capitalize on – and "institutionalize" – lessons learned from failures and successes • Insufficient attention paid to mentoring	***Ensure training and development programs build needed competencies, including more effective incorporation of knowledge sharing and mentoring in the development of employees.*** ***Capture knowledge and lessons learned (from failures and successes) in a more effective, systematic way.***	• Better performance through a more knowledgeable, more highly skilled workforce • Higher mission success rate
PERFORMANCE CULTURE	NASA achieves excellence by valuing and recognizing performance in an environment in which all employees feel encouraged to contribute.	• Performance expectations ambiguous (e.g., accountability, effort v. results) • Fail to deal adequately with poor performance	***Assure the Agencywide performance management system focuses on accountability for results.*** ***Assure that employee rewards and recognition programs are adequately linked to performance that contributes to achievement of Agency goals.***	• Improved personal and organizational performance • Enhanced mission success through more effective use of the diverse talents/abilities of the workforce
LEADERSHIP	NASA has leaders who think strategically, inspire employees and achieve results.	• Lack of an integrated, strategic approach to leadership development • Do not fully benefit from insights/experience of existing leaders when developing future leaders	***Ensure that an integrated, strategic training and development program builds needed Agency leadership competencies.***	• Agency has right kind and number of diverse leaders to achieve mission success • Effective process to develop leaders for future NASA leadership roles/responsibilities

Implementation

As mentioned previously, a companion document to the SHCP – the Strategic Human Capital Implementation Plan (SHCIP) – has been developed which contains detailed action plans for the Improvement Initiatives identified above.

The SHCP will be factored into the Agency's strategic planning process to ensure that human capital issues are truly integrated into Agency planning. The goals and objectives of the Agency Strategic Plan, Enterprise Strategic Plans, Functional Leadership Plans, and Center Implementation Plans cannot be met without consideration of the human capital element. Development and updates of these documents, therefore, will support achievement of Agency human capital goals, tailored to the particular circumstances, and will address resolution of human capital issues that could impact performance.

In order to measure Agency progress toward more effective human capital management, NASA's annual budget and performance plan formulation process will also incorporate human capital themes. Agency-level measures that focus attention on areas of greatest interest to NASA management and reflect progress toward achieving the goals of this Plan will be included in Agency annual integrated budget and performance planning documents.

Measurement

A key element to successful implementation of the SHCP is periodic assessment of Agency progress toward meeting the goals it has set for itself. This can best be achieved via a hierarchy of metrics.

At the most basic level, a set of measures and/or an assessment process will be in place to provide insight into the overall "health" of an initiative, function (such as human resources programs and initiatives), or organization. The next higher level will be a smaller set of measures that senior management requires to understand the current state, provide feedback, and set goals and make course corrections. The highest level of metrics are those "critical few" that senior management and stakeholders care most about. These latter metrics, in particular, are appropriate for incorporation into the Agency annual budget and performance plan formulation process.

Critical Few. Currently, two objectives and accompanying metrics are identified. They are briefly described here and covered in greater detail in the SHCIP.

- **Objective 1: Continuous progress in closing gaps in NASA's critical competencies.**

Assuring that NASA has the strategic competencies it needs is essential. This metric is intended to provide the Agency with information on how successfully and quickly this is occurring. It is unlikely, however, the Agency will ever attain a state in which ***all*** competency needs are ***always*** filled. Changing missions, as well as changes in the workforce due to retirements and other losses, are unavoidable. What NASA can strive to achieve is a state where filling strategic

competencies – particularly those deemed *critical* – is a planned, focused activity with appropriate tools made available to address competency needs.

Competency gaps can be addressed in a number of ways, including civil service hiring (full-time permanent, terms, and temps), succession planning, contracting with the private sector and/or academia, agreements with other agencies/entities, IPA's, training, and retraining. Training opportunities, for example, can create a pipeline for particularly scarce skills requirements while providing new career paths for the current versatile, talented workforce.

Civil service hiring efforts can include the use of recruitment and relocation bonuses, tuition reimbursement, and other personnel flexibilities to the extent these tools and flexibilities are necessary to attract needed skills. NASA will only acquire via civil service workforce hiring those skills and competencies required to be performed in-house, or which have been determined more efficiently and effectively performed in-house as a result of competitive sourcing activities. Others will be acquired via other means, as appropriate.

Identification of strategic competencies, and within this category those that are critical, are those defined as such by senior Agency and Center management. Filling those competencies involves the coordinated efforts of individuals across the NASA organization – in the Enterprises, Centers, and Functional Offices. The human resources community plays a key role by providing appropriate programs, processes, and tools for acquiring the needed competencies.

- **Objective 2: Alignment of NASA's human capital strategy with its mission, goals, and organizational objectives.**

This metric will assess NASA's performance in a number of areas the Agency considers important – a) whether people have the resources they need to perform their jobs; b) whether the performance management system is effective in identifying poor performance and taking steps to improve performance; c) whether the awards and recognition programs incentivize and reward the behaviors the Agency wants to foster; d) whether the workforce has adequate opportunities for learning and improvement; and e) whether NASA fosters an environment of inclusiveness, openness, trust and respect. Progress will be measured via periodic survey.

Other metrics may be identified from time to time for inclusion in the annual budget and performance planning processes. They may include specific metrics at the program level when human capital issues related to a given program can reasonably be expected to affect an Enterprise's or Center's ability to safely accomplish program goals and objectives.

Accountability for Results

Achieving results is the shared responsibility of all organizations at all levels. Management commitment is particularly critical and, ultimately, management will be held accountable.

The Office of Human Resources and Education and the Agency human resources community, in their capacity as strategic advisors to Agency and Center management, play a key role in strategic management of human capital by providing timely workforce planning and analysis, early participation

in the program planning and implementing process with respect to resource requirements, and identification of possible methods and tools for acquiring needed competencies. Line managers are responsible making effective use of human capital-related data, programs, practices, and tools and for identifying impediments to, and opportunities for improvement in, management of human capital.

A project manager is assigned to oversee and ensure implementation of each improvement initiative. Metric(s) will be established both for tracking progress toward implementation and for determining ultimate success of each initiative. These metrics will be maintained by the organizations assigned to implement the initiatives, while the Headquarters Office of Human Resources and Education (Code F) will be responsible for reporting progress to senior management. The Centers, through the Headquarters offices with oversight responsibility for them, will be responsible for collecting and reporting Center supporting data.

A more detailed description of roles and responsibilities is contained in Appendix A.

APPENDIX A

Roles and Responsibilities

Effective implementation and integration of the NASA SHCP into the Agency's day-to-day operations requires the commitment of the entire NASA organization. Agency and Center senior management will demonstrate their commitment to achievement of the Plan's goals. The Headquarters Office of Human Resources and Education and the human resources community at the Centers will play a key role as strategic advisors to Agency and Center management on human capital issues. Other Functional Offices will ensure that management of their functional responsibilities also includes consideration of human capital issues that could affect their ability to efficiently and effectively support the Agency mission. The Agency's human capital goals cannot be achieved, however, without direct and active Enterprise and Center involvement. They manage the Agency workforce on a day-to-day basis. They determine what workforce needs must be met to successfully and safely execute programs and projects and to what extent they use the human capital tools made available to them. As a result, they are ultimately accountable for assuring the human capital outcomes the Agency requires. A list of respective roles and responsibilities is reflected below. Items listed are not intended to be all-inclusive but to represent the nature of each group's involvement in managing the Agency's human capital.

Agency and Center Senior Management	▪ Committing to an integrated, Agencywide approach to human capital management ▪ Clearly communicating commitment and support for implementation ▪ Holding managers accountable for results
Headquarters Office of Human Resources and Education and Center Human Resources Offices	▪ Providing timely workforce planning and analysis ▪ Periodically assessing internal and external factors that may affect the Agency's ability to obtain and retain a highly skilled, productive workforce ▪ Participating early in program planning and implementation with respect to resource requirements ▪ Developing human capital programs, practices, and tools that support the Agency's ability to achieve mission success, with input from Enterprises and Centers ▪ Assessing and reporting Agency and Center progress in human capital management ▪ Identifying impediments to and opportunities for improvement in management of human capital
Enterprises and Centers	▪ Participating in the development and implementation of the SHCP improvement initiatives ▪ Incorporating human capital considerations in Enterprise Strategic Plans and Center Implementation Plans ▪ Assuring that individual Center and Enterprise human capital strategies are aligned with the Agency Strategic Human Capital architecture ▪ Making effective use of human capital-related data, programs, practices, and tools ▪ Providing data to support human capital-related metrics ▪ Identifying impediments to and opportunities for improvement in management of human capital ▪ Producing the desired human capital results
Headquarters Functional Offices	▪ Identifying/making recommendations on human capital issues effecting functional support to Agency mission

Appendix B

NASA's Human Capital Challenge
August 2002

The National Aeronautics and Space Administration is one of the Nation's leading Federal research and technology agencies. As an agency that possesses some of our Nation's most unique tools, capabilities and expertise, NASA represents a national asset and investment that is unparalleled in the world.

The Agency's ability to fulfill its ambitious mission is dependent on the quality of its workforce. NASA employees must be world-class if they are to be expected to break new ground in science and technology, explore the universe, or pioneer exciting discoveries here on Earth and beyond. NASA needs the best and the brightest – not only in the science and engineering workforce, but also among the professionals who support NASA's technical programs and address the Agency's financial, human capital, acquisition, and business management challenges.

Today, NASA's ability to maintain a workforce with the talent it needs to perform cutting-edge work is threatened by several converging trends. Some of them are nationwide trends, while others represent patterns and demographics within NASA. Each trend in isolation is cause for concern; in concert the indicators are alarming.

STRATEGIC THREATS

The pipeline for tomorrow's scientists and engineers is shrinking.

There is a shortage of students pursuing degrees in disciplines of critical importance to NASA – science, mathematics, and engineering. Several recent National Science Foundation reports document the shrinking of the S&E pipeline over the past decade. This trend begins at the undergraduate level and extends through the ranks of doctoral graduates. A few statistics illustrate the scope of this trend:

- Undergraduate Engineering Enrollment – The number of students enrolling in undergraduate engineering decreased by more than 20% between 1983 and 1999. *[National Science Board, Science and Engineering Indicators-2002, Arlington, VA: National Science Foundation, 2002 (NSB-02-01)]*

- Graduate S&E Enrollment – Engineering graduate enrollment also declined – from a high in 1992 of 128,854 to 105,006 in 1999. Graduate enrollment in the physical sciences, earth sciences, and mathematics also showed a downturn between 1993 and 2000. *[National Science Foundation Data Brief, Growth Continued in 2000 in Graduate Enrolment in Science and Engineering Fields (NSF-02-306), December 21, 2001)]*

- Awarding of Doctoral Degrees – By the year 2000, the number of doctorates awarded annually in engineering had declined by 15% from its mid-decade peak; since 1994, the number of doctorates in physics declined by 22%. *[National Science Foundation, Info Brief Declines in U.S. Doctorate Awards in Physics and Engineering (NSF-02-316), April 2002]*

- Foreign S&E Enrollment – The enrollment numbers, however disappointing, do not reflect the actual pool of viable candidates for NASA positions, since many of the students are non-U.S. citizens. Forty percent of the graduate students in America's engineering, mathematics, and computer science programs are foreign nationals. In the natural sciences, the number of non-citizens is nearly 1 in 4. *[National Science Board, Science and Engineering Indicators-2002, Arlington, VA: National Science Foundation, 2002 (NSB-02-01)*

- Aerospace Engineering Enrollment – Graduate enrollment in aerospace engineering has declined steadily in recent years – from 4,036 in 1992 to 3,407 in 2000, suggesting a diminishing interest in that career field. *National Science Board, Science and Engineering Indicators-2002, Arlington, VA: National Science Foundation, 2002 (NSB-02-01) and National Science Foundation Data Brief NSF-02-306, December 21, 2001.*

The shrinking S&E pipeline has great significance to NASA since the Agency relies on a highly educated science and engineering workforce. Nearly 60% of the total NASA workforce is S&E, and fully half of those employees have Masters or Doctorate degrees.

The demand for the technical skills NASA needs is increasing.

At the same time that the national S&E pipeline is shrinking, the job market for science, engineering, and technical occupations is projected to increase dramatically over the next ten years.

- Employment in the fields of science and engineering is projected to increase about 3 times faster than the rate for all occupations between 2000 and 2010, mostly in computer-related occupations. Increases in engineering and the physical sciences are projected at 20% and 15%, respectively. *[National Science Board, Science and Engineering Indicators-2002, Arlington, VA: National Science Foundation, 2002 (NSB-02-01)]*

There are several reasons for this.

First, the need for technical expertise no longer is confined to the technical industries that have been traditional competitors. Graduates in the S&E fields now are sought after by the banking industry, entertainment industry, and other employers that were not traditionally considered employers of technical graduates.

Second, the academic sector has become a very strong competitor for the same high-quality technical workers NASA seeks. America's top universities can offer very competitive salaries to exceptional talent.

Finally, the number of retirements among S&E-degreed workers is projected to increase dramatically over the next 20 years as the baby boomers reach retirement age; competition for quality S&E workers will intensify as employers seek to fill the vacancies created by these retirements.

The challenge is made more difficult by the fact that there is low interest in government employment among today's graduates. According to a recent (October 2001) Hart-Teeter poll, the lowest levels of interest in government employment were found among college-educated and professional workers. Only 16% of college-educated workers express significant interest in working for the Federal government, and a like number of professionals and managers would opt for a government job. In

contrast, the poll also revealed that positive perceptions of private sector work increased dramatically among those with formal education.

There is a lack of diversity in the S&E applicant pool.

NASA faces the challenge of building a workforce that is representative of the Nation's diversity. At this time, the NASA S&E workforce mirrors that of the nationwide S&E workforce – it is predominantly white male. Currently, 80% of the S&E workforce within NASA is white and 82% is male. Since the undergraduate S&E pool also lacks diversity to the same or greater extent, NASA is unlikely to improve upon these demographics without new tools, flexibilities, and strategies to attract diverse applicants to the Agency. Employers from private industry and academia as well as the public sector all strive to achieve diversity within their workforce, so competition for a relatively small pool of minority and female scientists and engineers is keen. NASA must struggle to compete with these employers, many of which have the means to offer more competitive job offers to achieve their diversity goals

Skills imbalances, gaps, and lack of depth currently exist within the NASA workforce.

NASA's ability to manage its human capital is exacerbated by the state of its current workforce. The Agency currently has skill gaps in areas such as nanotechnology, systems engineering, propulsion systems, advanced engineering technology, and information technology. In emerging technology areas, NASA projects the need to employ more civil servants in "hard to fill" areas such as astrobiology, robotics, and fundamental space biology. Other professional areas such as financial management, acquisition, and project management, are also essential to the Agency's ability to manage our resources and programs.

NASA underwent significant downsizing over the past decade, reducing its workforce from approximately 25,000 civil servants in FY 1993 to slightly more than 18,000 (full-time permanents) by FY 2002. Although every effort was made to retain key skills, the goal of avoiding involuntary separations in achieving workforce reductions made it impossible to control the nature of the attrition. Inevitably, the Agency lost individuals with key skills, and now these skills need to be replaced.

Unfortunately, NASA's need to reconstitute the workforce with the right skills and abilities is occurring at the very time in which competition for workers with those skills is intense.

Significant loss of knowledge is possible due to potential retirements within the S&E workforce.

The skills gaps and lack of depth in critical competencies is likely to worsen with time. New skills imbalances will occur over the next several years as the aging workforce reaches retirement eligibility. Approximately 15% of NASA's S&E employees are eligible to retire now. Within 5 years, almost 25% of the current workforce will be eligible to retire. In an Agency where the expertise is not as deep in many areas, even a few retirements can be critical.

Another way to look at the potential loss of knowledge is to examine NASA's current S&E profile. At this time, within the S&E workforce, NASA's over-60 population outnumbers its under-30 population by nearly 3 to 1. The age contrast is even more dramatic at some NASA Field Centers. By comparison,

in 1993 the under-30 S&E workforce was nearly double the number of over-60 workers. This is an alarming trend that demands our immediate attention with decisive action if we are to preserve NASA's aeronautics and space capabilities.

Recruitment and retention problems are increasing.

The Agency has seen indications of greater difficulty over the past several years in recruiting and retaining employees. One such indication has been the extent to which NASA is using monetary incentives to sustain a workforce with the right skills. The number of recruitment bonuses given to scientists and engineers increased significantly over the past three years – reflecting the need to become more competitive with other employers. The need for retention bonuses to keep individuals with critical skills has increased dramatically as well.

Historically, NASA has enjoyed unusually low attrition rates, due in part to the attraction of our unique mission and the high level of job satisfaction among employees. However, the attrition pattern among NASA's most recent hires indicates that the younger, more recently hired employees are leaving the Agency more readily. Compared to an overall attrition rate of just under 4% for all S&E's, the departure rate for S&E's hired since 1993 is nearly double – despite the fact that in the fall of 2000 the Agency was no longer undergoing the turmoil of downsizing. After factoring out the 55+-retirement eligibility group, attrition among the S&E workforce is highest in the 25-39 age group. This phenomenon has a multi-faceted impact on NASA. It represents a lost investment for the Agency, shrinks the potential pool of future leaders and managers, and skews the average age of S&E workforce toward retirement-eligibility age.

All these trends provide immediate warning signals that significant measures must be taken to address workforce imperatives that ultimately impact mission capability. Past solutions and existing personnel flexibilities are no longer adequate. To address these human capital challenges, NASA needs additional tools. Without such tools, NASA's challenge will soon become its crisis in human capital management.